

THE RHODESIAN JOURNAL

of

ECONOMICS

The Quarterly Journal of the Rhodesian Economic Society

Editorial Board:

A. M. Hawkins (Editor), J. A. C. Girdlestone, M. L. Rule, P. J. Stanbridge
and P. Staub.

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Articles

The Importance of Water Development in the Economic Growth of Rhodesia

R. M. M. Cormack

The late Mr. Cormack was an expert in the field of Water Resource development and was at one time Chief Planning Officer for the Sabi-Limpopo Authority.

THE IMPORTANCE OF WATER DEVELOPMENT IN THE ECONOMIC GROWTH OF RHODESIA¹

R. M. M. CORMACK

Introduction

The ever-increasing emphasis on "Development" of every aspect of our environment is perhaps the outstanding characteristic of the age we live in. For many thousands of years man was able to survive with a minimum of modification to the provisions of nature and we, in the less developed parts of the world are in danger of assuming that we can continue to live in this way when in fact we cannot.

At the University of the Witwatersrand Graduation Ceremony on the 13th December, 1968, Mr. Monte Bryer, former President of the South African Institution of Architects, said that more than 40 new cities, each with over 100,000 of a population, would be needed in South Africa by the year 2,000 ! !

"More buildings will have to be built in the next 30 years than have been built in the past 300 years", he said. "The building industry which today accounts for a yearly expenditure of R550 million, will have to expand its capacity at least three times."

Total capital expenditure to meet the building demand alone was R50,000 million. It was unlikely that these new cities would be models of efficiency or models of social living in which quality was rated as highly as quantity.

The greatest challenge of the future would be to balance the increasing quantity of development with quality of living. "There is an enormous job to be done in making your world a better one to live in for all the people of this country."

That was Bryer the Architect at Wits graduation—not Cormack sounding off in the back woods of Rhodesia.

The reason for this enormous urban increase is simple—it is necessary to adjust the present state of imbalance between urban and rural population whilst at the same time providing for the high population growth rate—"necessary" that is, if a modern Western type economy is envisaged.

The question of whether or not this type of economy should be pursued will not be discussed in this paper. I believe that the majority of us accept this aim although many of us have given little, if any thought to its implications.

The Changing Face of our Economy

During the past century there has been a great advance in the mechanisation of many of our activities ranging from book-keeping to communications, from agriculture to the culinary arts. These changes have resulted in an ever-increasing proportion of our people being concentrated in urban/industrial communities, in manufacturing and marketing the products of industry and of an ever-decreasing proportion being required to live on the land in order to produce our needs in food and fibre. Our whole economy is becoming increasingly mechanised and thus dependent on the products of industry. Whether we agree with these changes or not, whether we favour them or not,

1. Paper read to the Society in July 1969.

is beside the point. They are factual and we must cater for them and plan for them, or be overwhelmed by the poverty that will inevitably follow our failure to do so.

In the United States of America which is an example of an advanced modern and Western type of society, the ratio of rural to urban population is about 6% rural to 94% urban.

In Rhodesia it is about 20% urban to 80% rural and we must expect a steady change in this ratio whilst at the same time catering for a population growth rate of 3. % per annum.

There is growing public recognition of the importance of Water Development throughout the country

On the 16th December, 1968, Mr. Standish Harris, Chairman of the Bulawayo Chamber of Industry, warned of the danger of our expecting too rapid a growth rate in secondary industry without a corresponding growth in primary industry and indicated the importance of agriculture as our major primary industry and pointed to the need for a "bold, determined, long-term water development policy" in order to ensure agricultural as well as urban growth.

On the 16th May, 1968, Mr. John Graylin, a former (Federal) Minister of Agriculture, in opening the 20th Annual Conference of I.C.A. Committees, called for a bold imaginative plan to develop the land and combat drought.

The Sadie Report drew attention to the importance of water development and gave it top priority in our needs for economic growth.

Mr. Tim Mitchell, addressing the R.N.F.U. Congress in Salisbury on the 3rd July, 1968, said that droughts were a permanent feature of our climate and that a permanent solution must be found. He said a major need existed for irrigation development and water use planning on the Highveld. "The present water shortage and lack of water development could lead to a total collapse of agriculture in some areas which up to now have been regarded as our most profitable and productive," said Mr. Mitchell.

Our Water Resources

While it is generally agreed that we need to develop our water resources, there is also a great deal of misunderstanding about what these resources are and about what can and what should be done with them. All our water originates from rain, and whilst we are not as well endowed with rain as some parts of the world, we are nevertheless reasonably well off and a great deal better off than many parts as the following table shows:

<i>Country</i>			<i>Mean Annual Rainfall (approx.)</i>
U.S.A.	..	..	29 inches
Australia	..	..	14 inches
South Africa	..	..	20 inches
Israel	..	..	15 inches
Rhodesia	..	..	25 inches
World Average	...	...	26 inches

Our rainfall is erratic and is concentrated into a short wet season. It is necessary, therefore, to plan development so as to carry forward water supplies from the wet season to the dry season and from the good years to the bad years. We need a managed water economy.

A rainfall of 25 inches on Rhodesia represents a delivery of 52 million million gallons of water per annum, and if we could harness six per cent of this, we would have over 3.1 million million gallons for our needs.

This is enough water to sustain an urban population of 142,000,000 people on an allowance of 60 gallons per person per day, which is what a modern urban community needs.

But we are not a modern urban community. Eighty per cent of our people live on the land in a peasant rural context.

If, at the other end of the scale, we were to use all this water for rural needs we could irrigate a little over 2,000,000 acres on an all-year round basis. Assuming that a family of five could live on five acres of this land, the irrigated land would directly support a little over 2,000,000 people. In addition, I believe we can support a dryland rural population of about 8 million, provided we develop our resources fully, including our water resource, thus making a total of 10 million if all our water is used for rural development.

Neither of these two extremes is desirable nor indeed even feasible and a middle course must be sought between the purely rural and the purely urban use of our water resources. If we were to develop half our water resources for urban use and half for rural use, as is the case in the United States of America, we could sustain a population of some 80,000,000 made up of—

71,000,000 in urban communities
8,000,000 in dry-land agriculture
1,000,000 in irrigation agriculture
<hr/>
80,000,000 Total

But we cannot achieve 100% utilisation of the available 6% of rainfall and indeed a 70% utilisation would be very good. On this basis we could support a population of about 60 million.

This table, derived purely on the basis of what our resources will allow, gives a very good indication of the kind of society that must inevitably emerge if we are to survive.

At our present rate of population growth it would take about 100 years to reach these figures. But, in this regard, we must bear in mind that we have nearly reached the half-way mark in our rural population and we are likely to reach the limiting figure in rural population in about 20 years.

Once there is rural saturation we must expect to support all the increase in urban communities and our economy must by then be capable of catering for this. It is clear that rural saturation is not far distant and we must begin to cater for these conditions now.

Our Agricultural Potential

Rhodesia's agricultural economy is essentially a dryland economy and no amount of development can change this basic character. Our water potential is such that we can only irrigate about 2 million acres if *all* our water resources are fully used for irrigation or about 1 million acres if half is used for urban/industrial purposes and the balance for irrigated agriculture. This is about 1% of our land, and it can only add about 12% to the total numbers that can be supported directly on the land. With an agricultural economy that is and must inevitably remain a dryland economy, it is essential that the limited water available for irrigation be used in direct support of the dryland economy.

One of its main functions must be to stabilise the dryland economy and insure it against the more severe effects of drought. To do this irrigation development must be widespread and must be planned to give priority where the need is greatest and where the total benefit, both direct and indirect is greatest.

In Matabeleland for instance, the farming industry is based on beef and water development in direct support of the beef industry is needed. This industry has suffered heavily over the past 8 years due to the absence of firm policy guidance even in the very limited water development that has taken place. Beef is one of our most saleable products and it commands a remarkably stable world-wide market as the Minister of Agriculture very recently pointed out—and in this setting we have the remarkable spectacle of postage-stamp wheat production schemes in tribal areas for people who are traditionally cattlemen—in a country that is eminently suited to cattle raising and in which beef will always be the mainstay of rural production, but which sorely needs water development both for primary use and for feed production in order to lessen the decimating effects of the periodic droughts that characterise the climate.

We must beware of the mirage of self-sufficiency in crops for whose production we import the fuel, the machinery, the motive power, insecticides and fertilisers whilst we fail to capitalise on our natural endowments, e.g. vast areas of veld capable of producing high grade beef—but in need of the support and stabilising effect of water development.

Population Growth and Distribution

Rhodesia has one of the highest population growth rates in the world, viz. a compound rate of $3\frac{1}{2}\%$ per annum. At this rate population doubles in under 20 years, and in spite of the pill's grim progress, I doubt whether we can materially change this in a single generation. The results of the recent census suggest that our population growth rate may even be a little higher than the above figure of $3\frac{1}{2}\%$.

In my view we can accommodate, provided the requisite development is done, some 8 million people in dryland agriculture and already we have about 3.75 million on the land. If present trends continue we shall reach saturation on the land in about 20 years and further population growth must then be provided for in urban/industrial communities.

If we assume that over the next 20 years the population ratio will change from 20% urban and 80% rural to 40% urban and 60% rural, in other words,

a change in ratio of 1 % per annum, and that the total will grow at a compound rate of $3\frac{1}{2}$ % per annum, the population will be $\pm 8\frac{1}{2}$ million 20 years from now, and of this, about 60 % will then be rural, i.e. 5.1 million and 40 % or 3.4 million will be urban. If we further assume that irrigation development should be matches to rural population, then by 1989 we should have

5.1

$$\frac{5.1}{9.0} \times 1,000,000 = 570,000 \text{ acres under irrigation.}$$

By the same token we should now have

3.75

$$\frac{3.75}{9.0} \times 1,000,000 = 420,000 \text{ acres under irrigation.}$$

In point of fact we have only a little over 100,000 acres irrigated—about 1 acre per 37 people on the land. We *should* have one acre per 9 people on the land and it does not need a very fertile imagination to appreciate the difference between these two ratios in terms of stability and productivity in our agricultural economy. If we set ourselves a target of overtaking the backlog over the next 20 years, we must aim to develop 470,000 acres of new irrigation in 20 years—i.e. 23,500 acres per annum—and the planning, organisation, training and administration of such a programme will be immense.

Consider for instance training. If half the new development is in African areas, i.e. $\pm 13,000$ acres per annum, and assuming one irrigator per 4 acres, it will require a training programme for producing some 3,000 irrigators per annum—and this is no mean task.

Marketing, and a host of other requirements on a like scale will be needed.

In order to minimise these tasks we *must* plan well and with the long-term in view. We should, for instance, give preference to the development of European irrigation in the earlier phases, and in already established farming areas. By so doing, much of the training needed for Africans will be catered for in the form of employment on European schemes. The number of Africans employed will probably be greater in this way and the national product will be greater. Moreover, by consolidating existing development in this way, less secondary capital expenditure will be needed for roads, schools and other services.

Figures published show how the ratio of urban to rural population changed in a part of the Columbia River basin from 1900 to 1940 and that the rate of change was nearly 2 % per annum for the period 1900 to 1920 and over 1 % from 1920 to 1940. This suggests that my assumed 1 % per annum is, if anything, on the low side.

The same figures also show the rate at which irrigation was developed over the years 1900 to 1940 and the rate at which urban and rural populations grew over the same period. It is interesting to note that the irrigated acreage rose rapidly from 1900 to 1920 and then remained almost static from 1920 to 1940. Likewise both the rural and urban populations grew rapidly over the first 20 years. In the second 20 years the rural population was static whilst the urban population continued to grow albeit at a slower rate.

The Dangers of Failing to Move Forward with a Clear, Bold and Rational Water Development Policy

Rhodesia has for many years enjoyed an enviable reputation with regard to conservation of Natural Resources. It has made great strides in the field of

economic development and the provision of social services.

But the stark fact we are fast running out of land for the continued accommodation of our rapidly expanding population on the traditional pattern has been glossed over and has now reached a stage where we must face up to it by the enunciation of sound policies to cater for this growth—or else we will face a collapse of the land, of primary production from the land, and our whole economy will become top-heavy and unstable. It is essential to increase the *productivity* of the land and an indispensable corollary of this is that we must relieve the pressure of population on the land. We must urbanise and industrialise whilst at the same time increasing primary production to maintain a balanced economy. Our two great sources of primary wealth are land and minerals—and both of these need water development. But the urban communities which will contain the bulk of our population in the future and which will be the main employment generation centres, must also be catered for.

Water Development has become a *sine qua non* for the implementation of policies which will—

- (a) Increase the productivity of the land and stabilise it against the more severe effects of drought, and
- (b) Relieve the pressure on the land by providing for our growing population in urban/industrial communities.

Unless we meet these needs with well-founded, courageous and imaginative planning, our economic future will be a dismal one.

Some of the More Pressing Needs—Particularly in Research

A few examples of the more pressing development needs may serve to underline the kind of policies we need.

Whilst we are reasonably well-off for data on water resources there is still a great deal to be done in this field and especially in the matter of processing, interpreting and publishing the data. The gathering, processing and publication of data is essentially a Government function and it is necessary in a society which subscribes to the principles of private enterprise for Government to perform this function and to make up-to-date information readily available to those who need it for planning development in every sector of our economy.

In the matter of our underground water resources our information is woefully inadequate. In the North-West of Matabeleland for instance there is a very large area (some 10 million acres) in which the geological formation promises well for underground water which could make a significant contribution to the economy of the area. But there is a serious lack of definite information about it. If one assumes for instance that 1% of the rainfall could be recovered from boreholes in this area there would be 200,000 acre feet available and this could be widespread throughout the area.

The whole subject of our underground water needs a great deal more investigation and a matter of particular importance both in this regard and as it affects our rivers is land use. In our Eastern Districts the question of the use of land for plantations of exotics has for many years been a very thorny one but whilst this facet of the matter has received some attention the problem

extends far beyond this. Forms of land management for instance which denude the surface of its grass cover, such as may be seen on an extensive scale in the Tribal Trust Lands must have a very substantial effect on our underground water and on river flows—but the effect needs a great deal more study. Forms of land use which encourage bush encroachment have probably played far more havoc with our water resources than exotic plantations—and we know too little about these effects.

There is a popular belief that we are in danger of pumping too much water from our underground sources. The *real* threat, however, is in misuse of the land resulting in such a diminished rate of replenishment of our underground water that even if we pumped none at all it will be seriously depleted. In our Tribal areas this threat is very real indeed, and no amount of dam building can compensate for it. We need only consider the following conservatively based figures to appreciate this:

- (a) One borehole per 2 square miles (an intensity we are not even near approaching) each pumping 2,000 gallons per hour for 10 hours per day removes about 16 gallons per acre.
- (b) 1,000 Scrubby bushes could take 1,000 gallons per acre per day—i.e. 60 times as much as (a).
- (c) Thus scrubby (and useless) vegetation could account for 66% of rainfall whilst pumping, even at the intensity envisaged above, would only take about 1%.

For many years now we have said that we recognise that water will become a limiting factor on development before land does—but we do not give practical effect to this well-founded belief by putting more effort into the study of such matters as the effect of land use on water resources even though a considerable amount of study goes into land use practices or their effects in other directions.

Percentage Run-off

I mentioned earlier that about six per cent of our rainfall runs off. But what does this mean? It is an overall average covering a very wide variety of conditions. In the N'Cema catchment, for instance, from which Bulawayo draws part of its water requirement—about 8% of the long-term average rainfall runs off—measured at N'Cema. But measured where it reaches the Limpopo it would be far less than this because much would be lost en route and progressively less accrues as one proceeds South, and this is the general picture. At and around Salisbury the run-off is probably about 15% to 20% of the mean annual rainfall—measured in that vicinity. But the amount reaching the Zambesi is far less.

$8\% \text{ of } 25'' = 2'' \text{ of run-off.}$

$15\% \text{ of } 35'' = 5\frac{1}{4}'' \text{ of run-off.}$

The Need for Policy Direction

I said earlier that we have an enormous backlog in irrigation and that to overtake it we should develop some 23,000 acres per annum over the next 20 years.

In order to do this, or anything like it, we will need large-scale long-term planning—and large-scale long-term finance. We cannot have either unless we first have a sound long-term broadly based national long-term policy. Good planning can only flow from a sound policy and finance should only go into well-planned development.

Out of a sound long-term plan we can develop an effective programme for the fulfilment of the plan and from this programme we can develop a process and machinery for the implementation of the programme. And none of these things can be finite—they must be and must remain flexible—they must evolve in detail around the hard-core of a policy founded on sound principles.

The Policy

What should be the first principles of our water policy?

1. Recognition of the fact that our agriculture is our most important primary producer—and recognition of the important possibility that mining might overtake it.

2. Recognition of the fact that our agriculture is and will always be, basically a dry-land agriculture, and that it is heavily dependent on an erratic and not very reliable rainfall. It needs the stabilising and consolidating effect of water development.

3. Our water resources are not such that we can ever become a great irrigating nation. Therefore their most effective role is “in support” and the need is widespread throughout the country.

4. Our population growth is such that we must expect and plan for a high rate of urbanisation and industrialisation and there is no time to lose on this. We should set aside about half our water resource for urban and industrial needs and we must put a great deal more effort into a closer study of these needs. The recently set up Tribal Trust Land Development Corporation has an enormous task to face and will have to develop a vigorous and dynamic approach.

We have a great future and we must have the faith to plan it well and to move fearlessly forward to the realisation of well-laid plans, confident that this course wherever it may lead, will be a better one than the nearsighted *ad hoc* development pattern of the past.



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